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Transformation of a single-photon field into bunches of pulses

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Abstract

© 2015 American Physical Society. We propose a method to transform a single-photon field into bunches of pulses with controllable timing and number of pulses in a bunch. The method is based on transmission of a photon through an optically thick single-line absorber vibrated with a frequency appreciably exceeding the width of the absorption line. The narrow spectrum of the incoming photon is "seen" by the vibrated absorber as a comb of equidistant spectral components separated by the vibration frequency. Tuning the absorber in resonance with mth spectral component transforms the output radiation into bunches of pulses with m pulses in each bunch. We provide a simple analytical solution clearly describing this effect and experimentally demonstrate the proposed technique with a single 14.4-keV photon and an ensemble of vibrated Fe57 nuclei. This method opens an alternate way to the production of time-bin qubits.

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